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Re: **Application No.** 09/325,534
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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

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1. (previously presented) A method of detecting upstream signal transmission quality of a cable modem on a cable modem network having a plurality of cable modems, the method comprising:

assigning a first time slot to the cable modem in which the cable modem can transmit data upstream;

reserving a second time slot for transmitting data upstream, unassigned to any cable modem on the cable modem network;

informing an FFT generator of the first time slot and of the second time slot;

generating one or more FFT measurements of an upstream spectrum during the first time slot when the cable modem can transmit upstream and the second time slot when no cable modem on the network is transmitting upstream; and

comparing FFT measurements of the first time slot with FFT measurements of the second time slot thereby detecting undesirable noise created by the cable modem.

2. (original) A method as recited in claim 1 further comprising informing the upstream receiver of the first time slot and the second time slot.

3. (previously presented) A method as recited in claim 1 wherein a Media Access Control unit assigns the first time slot and reserves the second time slot.

4. (original) A method as recited in claim 1 wherein the FFT measurements are of the entire upstream spectrum.

5. (original) A method as recited in claim 1 wherein generating one or more FFT measurements of an upstream spectrum further includes creating one or more frequency-power spectrum graphs.

6. (original) A method as recited in claim 1 wherein comparing FFT measurements of the first time slot with FFT measurements of the second time slot further includes calculating the difference between two FFT measurements.

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7. (original) A method as recited in claim 6 wherein calculating the difference between two FFT measurements further includes taking the difference between the power level of a first FFT point in a first FFT measurement and the power level of a corresponding FFT point in a second FFT measurement.

8. (original) A method as recited in claim 1 wherein comparing FFT measurements of the first time slot with FFT measurements of the second time slot further includes creating a power-difference FFT measurement.

9. (original) A method as recited in claim 1 further comprising incrementing a sampling counter after every second FFT measurement and using the sampling counter to determine whether more FFT measurements are needed.

10. (original) A method as recited in claim 6 further including calculating an average difference of a plurality of differences between two FFT measurements.

11. (original) A method as recited in claim 1 further comprising calculating power differences between the FFT measurement taken during the first time slot and the FFT measurements taken during the second time slot.

12. (original) A method as recited in claim 11 further comprising determining whether any of the power differences are greater than a predetermined threshold power ratio.

13. (previously presented) A method as recited in claim 12 further comprising informing a Media Access Control unit to not assign a time slot to the cable modem if any of the power differences are greater than the predetermined threshold power ratio.

14. (original) A method as recited in claim 11 wherein calculating power differences further includes calculating power differences between pairs of corresponding FFT points taken from FFT measurements of the first time slot and FFT measurements of the second time slot.

15. (currently amended) A cable modem termination system (CMTS) which can issue time slots for upstream transmission by individual cable modems on a cable modem network having a plurality of cable modems, the CMTS capable of detecting faulty cable modems, the CMTS comprising:

an upstream receiver and demodulator capable of receiving an upstream signal;

a Fast Fourier Transform (FFT) engine capable of performing FFT measurements on the upstream signal and storing the FFT measurements; and

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a processor for performing computations on the FFT measurements and communicating data, wherein the data relates to noise levels of the upstream signal at predetermined times, wherein the predetermined times correspond to

a first time when a cable modem is transmitting data upstream, and

a second time when no data is being transmitted upstream,

wherein the processor is capable of informing the FFT engine of the first time and of the second time, causing the FFT engine to generate one or more FFT measurements of an upstream spectrum during the first time and the second time, and comparing FFT measurements of the first time with FFT measurements of the second time thereby detecting undesirable noise created by the cable modem.

16. (original) A CMTS as recited in claim 15 further comprising:

an anti-alias filter including a low-pass filter; and

an analog/digital converter capable of converting an analog signal to a digital signal.

17. (original) A CMTS as recited in claim 15 wherein the FFT engine further includes a field programmable gate array (FPGA) configured to perform an FFT.

18. (original) A CMTS as recited in claim 17 wherein the FPGA further includes a processor interface for communicating data to a processor.

19. (original) A CMTS as recited in claim 15 wherein the FFT engine further comprises memory units for storing twiddle factors and intermediate data for use in an FFT measurement.

20. (original) A CMTS as recited in claim 15 wherein the FFT engine is located outside a headend of a cable television plant.

21. (currently amended) A method of detecting a faulty cable modem in a cable television plant having a plurality of cable modems, the method comprising:

taking a first FFT measurement of an upstream spectrum, creating a first frequency-power spectrum, at a time when a cable modem is transmitting data upstream;

taking a second FFT measurement of the upstream spectrum, creating a second frequency-power spectrum, at a time when no data is being transmitted upstream by any of the plurality of cable modems in the cable television plant;

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calculating a power-difference between the first FFT measurement and the second FFT measurement; [[and]]

utilizing the power-difference to determine whether the cable modem is faulty; and

informing an FFT generator of the time when no data is being transmitted upstream and of the time when a cable modem is transmitting data upstream.

22. (original) A method as recited in claim 21 further comprising allocating a dummy time slot in which no data is transmitted upstream in the cable television plant.

23. (canceled)

23 24. (original) A method as recited in claim 21 wherein calculating a power-difference further comprises calculating the difference between corresponding FFT points in the first frequency-power spectrum and in the second frequency-power spectrum.

24 25. (original) A method as recited in claim 21 wherein utilizing the power-difference to determine whether the cable modem is faulty further comprises comparing the power-difference with a threshold power level.

25 26. (original) A method as recited in claim 24 25 wherein the threshold power level is 15 dB for QPSK modulation and 25 dB for QAM16 modulation.

26 27. (currently amended) A method of detecting faulty modems in a network employing multiple channels, separated in frequency to allow modems to transmit data, the method comprising:

for a selected modem transmitting data in a frequency channel, comparing extra-channel noise outside the frequency channel when it is transmitting data with a noise floor outside the frequency channel when neither the selected modem nor any other modem on the network is transmitting data; and

if the difference between the extra-channel noise when the modem is transmitting and when the modem is not transmitting is greater than a predetermined threshold, disabling the selected modem,

wherein comparing the extra-channel noise is performed by comparing frequency-power spectrums at two different predetermined times known to correspond to times when the selected modem is transmitting and when the selected modem is not transmitting, respectively.

28. (canceled)

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27 29. (original) A method as recited in claim 26 wherein the network is a cable television plant and the modems are cable modems.

28 30. (original) A method as recited in claim 26 wherein the predetermined threshold is 15 dB for QPSK modulation and 25 dB for QAM16 modulation.

29 31. (previously presented) A computer program product for detecting upstream signal transmission quality of a cable modem on a cable modem network having a plurality of cable modems, the computer program product comprising:

a computer code that assigns a first time slot to the cable modem in which the cable modem can transmit data upstream;

a computer code that creates a second time slot for transmitting data upstream, unassigned to any cable modem on the cable modem network;

a computer code that informs an FFT generator of the first time slot and of the second time slot;

a computer code that generates one or more FFT measurements of an upstream spectrum during the first time slot when the cable modem can transmit upstream and the second time slot when no cable modem on the network is transmitting upstream;

a computer code that compares FFT measurements of the first time slot with FFT measurements of the second time slot thereby detecting undesirable noise created by the cable modem; and

a computer-readable medium that stores the computer codes.

30 32. (currently amended) A computer program product for detecting faulty modems in a network employing multiple channels, separated in frequency to allow modems to transmit data, the computer program product comprising:

a computer code that compares, for a selected modem transmitting data in a frequency channel, extra-channel noise outside the frequency channel when the selected modem is transmitting data with a noise floor outside the frequency channel when neither the selected modem nor any other modem on the network is transmitting data;

a computer code that disables the selected modem if the difference between the extra-channel noise when the selected modem is transmitting and when the selected modem is not transmitting is greater than a predetermined threshold; and

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a computer-readable medium that stores the computer codes,

wherein comparing the extra-channel noise is performed by comparing frequency-power spectrums at two different predetermined times known to correspond to times when the selected modem is transmitting and when the selected modem is not transmitting, respectively.

31 (33. (previously presented) An apparatus of detecting upstream signal transmission quality of a cable modem on a cable modem network having a plurality of cable modems, the apparatus comprising:

means for assigning a first time slot to the cable modem in which the cable modem can transmit data upstream;

means for reserving a second time slot for transmitting data upstream, unassigned to any cable modem on the cable modem network;

means for informing an FFT generator of the first time slot and of the second time slot;

means for generating one or more FFT measurements of an upstream spectrum during the first time slot when the cable modem can transmit upstream and the second time slot when no cable modem on the network is transmitting upstream; and

means for comparing FFT measurements of the first time slot with FFT measurements of the second time slot thereby detecting undesirable noise created by the cable modem.

32 34. (previously presented) An apparatus as recited in claim 31 wherein means for comparing FFT measurements of the first time slot with FFT measurements of the second time slot further includes means for calculating the difference between two FFT measurements.

33 35. (previously presented) An apparatus as recited in claim 31 further comprising means for calculating power differences between the FFT measurement taken during the first time slot and the FFT measurements taken during the second time slot.

34 (36. (currently amended) An apparatus of detecting a faulty cable modem in a cable television plant having a plurality of cable modems, the apparatus comprising:

means for taking a first FFT measurement of an upstream spectrum, creating a first frequency-power spectrum, at a first time when a cable modem is transmitting data upstream;

means for taking a second FFT measurement of the upstream spectrum, creating a second frequency-power spectrum, at a second time when no data is being transmitted upstream by any of the plurality of cable modems in the cable television plant;

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means for informing an FFT generator of the first time and of the second time, causing the FFT generator to generate one or more FFT measurements of an upstream spectrum during the first time and the second time, and comparing FFT measurements of the first time with FFT measurements of the second time thereby [[means for]] calculating a power-difference between the first FFT measurement and the second FFT measurement; and

means for utilizing the power-difference to determine whether the cable modem is faulty.

35 37. (previously presented) An apparatus as recited in claim 34 further comprising means for allocating a dummy time slot in which no data is transmitted upstream in the cable television plant.

36 38. (previously presented) An apparatus as recited in claim 34 further comprising means for informing an FFT generator of the time when no data is being transmitted upstream and of the time when a cable modem is transmitting data upstream.

37 39. (previously presented) An apparatus as recited in claim 34 wherein means for calculating a power-difference further comprises means for calculating the difference between corresponding FFT points in the first frequency-power spectrum and in the second frequency-power spectrum.

38 40. (previously presented) An apparatus as recited in claim 34 wherein means for utilizing the power-difference to determine whether the cable modem is faulty further comprises means for comparing the power-difference with a threshold power level.

39 41. (previously presented) An apparatus as recited in claim 38 wherein the threshold power level is 15 dB for QPSK modulation and 25 dB for QAM16 modulation.

40 (42) (new) A method of detecting a faulty cable modem in a cable television plant having a plurality of cable modems, the method comprising:

taking a first FFT measurement of an upstream spectrum, creating a first frequency-power spectrum, at a time when a cable modem is transmitting data upstream;

taking a second FFT measurement of the upstream spectrum, creating a second frequency-power spectrum, at a time when no data is being transmitted upstream by any of the plurality of cable modems in the cable television plant;

calculating a power-difference between the first FFT measurement and the second FFT measurement; and

utilizing the power-difference to determine whether the cable modem is faulty,

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wherein utilizing the power-difference to determine whether the cable modem is faulty further includes comparing the power-difference with a threshold power level, and

wherein the threshold power level is 15 dB for QPSK modulation and 25 dB for QAM16 modulation.

41 (43. (new) A method of detecting faulty modems in a network employing multiple channels, separated in frequency to allow modems to transmit data, the method comprising:

for a selected modem transmitting data in a frequency channel, comparing extra-channel noise outside the frequency channel when it is transmitting data with a noise floor outside the frequency channel when neither the selected modem nor any other modem on the network is transmitting data; and

if the difference between the extra-channel noise when the modem is transmitting and when the modem is not transmitting is greater than a predetermined threshold, disabling the selected modem,

wherein the predetermined threshold is 15 dB for QPSK modulation and 25 dB for QAM16 modulation.

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